### Abstract:
The present invention relates to an amorphous form of idelalisib and processes for the preparation of the amorphous form. The invention also relates to pharmaceutical compositions that include the amorphous form of idelalisib.
AMORPHOUS FORM OF IDELALISIB

Field of the invention
The invention relates to an amorphous form of idelalisib and processes for the preparation of the amorphous form. The invention also relates to pharmaceutical compositions that include the amorphous form of idelalisib.

Background of the invention
The following discussion of the prior art is intended to present the invention in an appropriate technical context and allow its significance to be properly appreciated. Unless clearly indicated to the contrary, however, reference to any prior art in this specification should be construed as an admission that such art is widely known or forms part of common general knowledge in the field.

Chemically, idelalisib is (S)-2-(l-(9H-purin-6-ylamino)propyl)-5-fluoro-3-phenyl quinazolin-4(3H)-one (GS-1101 or CAL-101) having structural Formula I, is phosphoinositide 3-kinase inhibitor, developed by Gilead Sciences, approved by USFDA for Relapsed chronic lymphocytic leukemia (CLL), Relapsed follicular B-cell non-Hodgkin lymphoma (FL) and Relapsed small lymphocytic lymphoma (SLL).

![Structural formula of idelalisib](I)

Idelalisib is an investigational, targeted, highly selective oral inhibitor of phosphoinositide 3-kinase (PI3K) delta, a protein that is critical for the activation, proliferation and survival of B lymphocytes. PI3K delta signaling is hyperactive...
in many B-cell leukemias and lymphomas and drives proliferation, survival and trafficking to lymphoid tissue. Idelalisib is being developed both as a single agent and in combination with approved and investigational therapies.

International (PCT) Publication No. WO 2005/1 13556 A1 discloses quinazolones as inhibitors of phosphoinositide 3-kinase (PI3K) delta and provides preparation of idelalisib and related compounds but does not discuss about its polymorphic form.

International (PCT) Publication No. WO 2013/134288 A1 discloses various crystalline polymorphic forms of idelalisib, Form I, Form II, Form III, Form IV, Form V, Form VI and Form VII.

An amorphous form of some of the drugs exhibit much higher bioavailability than the crystalline forms, which leads to the selection of the amorphous form as the final drug substance for pharmaceutical dosage form development. Additionally, the aqueous solubility of crystalline form is lower than its amorphous form in some of the drugs, which may result in the difference in their in vivo bioavailability. Therefore, it is desirable to have an amorphous form of drugs with high purity to meet the needs of regulatory requirements and also highly reproducible processes for their preparation.

In view of the above, it is desirable to provide an amorphous form of idelalisib.

**Summary of the invention**

In one general aspect, there is provided an amorphous form of idelalisib of Formula (I).
In another general aspect, there is provided an amorphous form of idelalisib having a moisture content less than about 0.5% wt/wt. In particular, the amorphous form of idelalisib may be anhydrous.

The amorphous form of idelalisib may have the x-ray powder diffraction pattern as depicted in Figure-1.

In another general aspect, there is provided a process for the preparation of an amorphous form of idelalisib. The process includes providing a solution or suspension of idelalisib in one or more solvents; and obtaining the amorphous form of idelalisib by the removal of the solvent.

In another general aspect, there is provided a pharmaceutical composition that includes an amorphous form of idelalisib; and one or more pharmaceutically acceptable carriers, excipients or diluents.

In another general aspect, there is provided an amorphous solid dispersion comprising idelalisib and one or more pharmaceutically acceptable excipients.

The amorphous solid dispersion of idelalisib and a pharmaceutically acceptable excipient may have the x-ray powder diffraction pattern as depicted in Figure-2.
In another general aspect, there is provided a pharmaceutical composition comprising an amorphous idelalisib together with one or more pharmaceutically acceptable carriers, excipients or diluents.

In another general aspect, there is provided a pharmaceutical composition comprising an amorphous solid dispersion comprising idelalisib together with one or more pharmaceutically acceptable carriers, excipients or diluents.

The details of one or more embodiments of the inventions are set forth in the description below. Other features, objects and advantages of the inventions will be apparent from the description and claims.

**Brief description of the drawings**

*FIG 1.* shows an x-ray diffractogram (XRD) of amorphous idelalisib as prepared in example-1.

*FIG 2.* shows an x-ray diffractogram (XRD) of amorphous solid dispersion of idelalisib as prepared in example-4.

**Detailed description of the invention**

The above and other objects of the present invention are achieved by the process of the present invention, which leads to an amorphous form of idelalisib suitable for pharmaceutical preparations and having greater stability. The invention also provides amorphous solid dispersion comprising idelalisib and one or more pharmaceutically acceptable excipients.

As-used herein, the term "suspension" may be interchangeable with "slurry" and refers to a heterogeneous mixture where complete dissolution does not occur. Also, heating the suspension or slurry can result in a homogenous mixture where complete or partial dissolution occurs at an elevated temperature or ambient temperature.
All ranges recited herein include the endpoints, including those that recite a range "between" two values. Terms such as "about", "generally", and "substantially," are to be construed as modifying a term or value such that it is not an absolute. This includes, at very least, the degree of expected experimental error, technique error and instrument error for a given technique used to measure a value.

As used herein, the term "solid dispersion" means any solid composition having at least two components. In certain embodiments, a solid dispersion as disclosed herein includes an active ingredient idelalisib dispersed among at least one other component, for example a polymer.

The term "immobilize" as used herein with reference to the immobilization of the active compound i.e., idelalisib in the polymer matrix, means that molecules of the active compound interact with molecules of the polymer in such a way that the molecules of the idelalisib are held in the aforementioned matrix and prevented from crystal nucleation due to lack of mobility.

The product obtained by the process of the present invention may be further dried to achieve the desired moisture values. For example, the product may be dried in a tray drier, dried under vacuum and/or in a Fluid Bed Drier.

As used herein, "Particle Size Distribution (PSD)" means the cumulative volume size distribution of equivalent spherical diameters as determined by laser diffraction in Malvern Master Sizer 2000 equipment or its equivalent.

The important characteristics of the PSD are the (D90), which is the size, in microns, below which 90% of the particles by volume are found, and the (D50), which is the size, in microns, below which 50% of the particles by volume are found. Thus, a D90 or d(0.9) of less than 450 microns means that 90 volume-percent of the particles in a composition have a diameter less than 450 microns.
The term "pharmaceutically acceptable" means that which is useful in preparing a pharmaceutical composition that is generally non-toxic and is not biologically undesirable, and includes that which is acceptable for veterinary use and/or human pharmaceutical use.

The term "pharmaceutical composition" is intended to encompass a drug product including the active ingredient(s), pharmaceutically acceptable excipients that make up the carrier, as well as any product which results, directly or indirectly, from combination, complexation or aggregation of any two or more of the ingredients. Accordingly, the pharmaceutical compositions encompass any composition made by admixing the active ingredient, active ingredient dispersion or composite, additional active ingredient(s), and pharmaceutically acceptable excipients.

In one general aspect, there is provided an amorphous form of idelalisib of Formula (I).

In general, the amorphous form of idelalisib having a purity by HPLC of greater than about 98%.

In general, the amorphous form of idelalisib is having a purity by HPLC of >98%.

In particular, the purity by HPLC of > 99%, more particularly, the purity by
HPLC of > 99.5%, further more particularly, the purity by HPLC of >99.8%, most particularly, the purity by HPLC > 99.9%.

In general, the amorphous form of idelalisib having a residual solvent less than 0.5%.

In general, the amorphous form of idelalisib is substantially free from residual solvents. The term "substantially free" means residual solvents within the permissible ICH limits suitable for pharmaceutical preparations. For example but not limited to less than 0.5%, particularly less than 0.3% or more particularly less than 0.2%.

In another general aspect, there is provided an amorphous form of idelalisib having a moisture content less than about 0.5% wt/wt. In particular, amorphous idelalisib of Formula (I) may be anhydrous.

In another general aspect, there is provided an amorphous form of idelalisib characterized by x-ray powder diffraction as depicted in Figure-1.

In another general aspect, there is provided a process for the preparation of an amorphous form of idelalisib, the process comprising:
(a) providing a solution or suspension of idelalisib or suspension in one or more solvents; and
(b) obtaining the amorphous form of idelalisib by removal of the solvent.

In general, the solvent of step (a) comprises one or more of water, alcohol, ketone, ester, halogenated hydrocarbon, polar aprotic solvent, acetonitrile, tetrahydrofuran, 2-methyltetrahydrofuran, dioxane or mixture thereof.

In particular, the alcohol is selected from methanol, ethanol, isopropanol, 2-propanol, 1-butanol, t-butyl alcohol, 1-pentanol, and 2-pentanol; the ketone is selected from acetone, butanone, 2-pentanone, 3-pentanone, methylbutyl ketone,
and methyl isobutyl ketone; the ester is selected from ethyl acetate, propyl acetate, isopropyl acetate, t-butyl acetate, and isobutyl acetate; and the halogenated hydrocarbon is selected from methylene dichloride, ethylene dichloride, carbon tetrachloride and chlorobenzene; polar aprotic solvent selected from dimethylformamide, dimethylsulfoxide, and N-methylpyrrolidone. More particularly, methanol, acetone, ethyl acetate or methylene dichloride or mixture thereof may be used.

The step (b) involves removal of the solvent to obtain an amorphous form of idelalisib. The removal of the solvent comprises one or more of distillation, distillation under vacuum, spray drying, agitated thin film drying ("ATFD"), and freeze drying (lyophilization), filtration, decantation, and centrifugation.

The solvent may also be removed, optionally, at reduced pressure and/or elevated temperature.

The obtained amorphous form of idelalisib is stable under normal stability conditions and substantially free from residual solvent. There is no physical change observed from amorphous form to crystalline form during the stability.

In general, freeze drying (lyophilization) may be performed by freezing a solution of idelalisib at low temperatures and reducing the pressure to remove the solvent from the frozen solution of idelalisib. Temperatures that may be required to freeze the solution, depending on the solvent chosen to make the solution of idelalisib may range from about -70°C to about 10°C.

Alternatively, the isolation may also be effected by addition of anti-solvent to the solution obtained in step (a) or optionally after concentrating the solution obtained in step (a). The anti-solvent comprises one which reduces the solubility of idelalisib in the solution, causing the crystallization or precipitation spontaneously
or upon stirring. In particular, the anti-solvent may be added to the solution of idelalisib or idelalisib solution may be added to the anti-solvent.

In general, the anti-solvent comprises one or more of hydrocarbons selected from n-pentane, hexanes, n-heptane, cyclohexane, methylcyclohexane, toluene, and xylene; ethers selected from diethyl ether, diisopropyl ether, and methyl tert-butyl ether.

In another general aspect, there is provided a process for preparation of an amorphous form of idelalisib of Formula I comprising spray drying a solution of idelalisib that involves the spray drying of feed stock, which may be prepared conveniently by dissolving any known forms or wet cake of idelalisib in one or more solvents as described herein above.

In general, weighed quantity of idelalisib may be dissolved in 2-10 volumes of chosen solvent at a temperature from ambient temperature to reflux temperature of the solvent or mixture thereof, more particularly at about 25°C to about 100°C. The content may be stirred for 30 minutes at 25°C to 30°C. The content may be filtered through Hyflosupercell, and filtrate is spray dried under the conditions mentioned herein below. The obtained powder may be further dried at 60°C for 12-16 hours under vacuum to afford an amorphous form of idelalisib. In general, the feedstock for spray drying may be either a clear solution or in dispersion form.

In general, the spray drying of feed stock of idelalisib may be performed by maintaining the inlet temperature in the range of 35°C-80°C, nitrogen pressure of 2-6 kg/cm², the outlet temperature in the range of 30°C to 60°C, at a feed rate of 15% to 20% and maintaining the vacuum at 30-120 mm of Hg.

In general, the suspension of step (a) may be a heterogeneous mixture or a clear solution with homogenous mixture in solvent comprises one or more of water,
alcohol, ketone, ester, halogenated hydrocarbon, polar aprotic solvent, acetonitrile, tetrahydrofuran, 2-methyltetrahydrofuran, dioxane or mixture thereof.

In particular, the alcohol is selected from methanol, ethanol, isopropanol, 2-propanol, 1-butanol, t-butyl alcohol, 1-pentanol, and 2-pentanol; the ketone is selected from acetone, butanone, 2-pentanone, 3-pentanone, methylbutyl ketone, and methyl isobutyl ketone; the ester is selected from ethyl acetate, propyl acetate, isopropyl acetate, t-butyl acetate, and isobutyl acetate; and the halogenated hydrocarbon is selected from methylene dichloride, ethylene dichloride, carbon tetrachloride and chlorobenzene; polar aprotic solvent selected from dimethylformamide, dimethylsulfoxide, and N-methylpyrrolidone. More particularly, methanol, acetone, ethyl acetate or methylene dichloride or mixture thereof may be used.

In another general aspect, there is provided an amorphous solid dispersion comprising idelalisib and one or more pharmaceutically acceptable excipients. The pharmaceutically acceptable excipient is a non-ionic polymer or an ionic polymer.

In general, the polymer is selected from methacrylic acid copolymers, polyvinylpyrrolidone (PVP), 4-vinylpyrrolidone-vinyl acetate copolymer (copovidone) or copolymers of methacrylic acid and ethylacrylate (EUDRAGIT® L100-55), hydroxypropyl cellulose, hydroxypropylmethyl cellulose (HPMC), hypromellose phthalate, hydroxypropylmethyl cellulose acetate succinate (HPMC-AS). In particular, PVP of different grades like K-15, K-30, K-60, K-90 and K-120 may be used for the preparation of amorphous solid dispersion. More particular, hydroxypropylmethyl cellulose (HPMC) or hydroxypropylmethyl cellulose acetate succinate (HPMC-AS) and PVP K-30 may be used.

In some embodiments, the idelalisib of Formula (I) may be dispersed within a matrix formed by a polymer in its solid state such that it is immobilized in its
amorphous form. The polymer may prevent intramolecular hydrogen bonding or weak dispersion forces between two or more drug molecules of idelalisib.

In some embodiments, the ratio of the amount of weight of idelalisib within the solid dispersion to the amount by weight of the polymer therein is from about 1:1 to about 1:10. The composition of idelalisib with polymer may be prepared by using about 1:1 to about 1:10 polymers with respect to idelalisib. The usage of higher molar amount of polymer may increases the amorphous character of the drug substance.

In another general aspect, there is provided a process for the preparation of amorphous solid dispersion comprising idelalisib and one or more pharmaceutically acceptable excipients, the process comprising:

(a) providing a solution of idelalisib and one or more pharmaceutically acceptable excipients in one or more solvents;
(b) optionally, filtering the solution to remove insoluble matter; and
(c) removing the solvent from the solution to obtain the amorphous solid dispersion of idelalisib with the pharmaceutically acceptable excipients.

In general, the solvent comprises one or more of water, alcohol, ketone, ester, halogenated hydrocarbon, polar aprotic solvent, acetonitrile, tetrahydrofuran, 2-methyltetrahydrofuran, dioxane or mixture thereof.

In particular, the alcohol is selected from methanol, ethanol, isopropanol, 2-propanol, 1-butanol, t-butyl alcohol, 1-pentanol, and 2-pentanol; the ketone is selected from acetone, butanone, 2-pentanone, 3-pentanone, methylbutyl ketone, and methyl isobutyl ketone; the ester is selected from ethyl acetate, propyl acetate, isopropyl acetate, t-butyl acetate, and isobutyl acetate; and the halogenated hydrocarbon is selected from methylene dichloride, ethylene dichloride, carbon tetrachloride and chlorobenzene; polar aprotic solvent selected from dimethylformamide, dimethylsulfoxide, and N-methylpyrrolidone. More
particularly, methanol, acetone, ethyl acetate or methylene dichloride or mixture thereof may be used.

The amorphous solid dispersion may be obtained by removal of solvent for example by filtration, concentration, spray drying, lyophilization, flash evaporation, and vacuum distillation, thereby leaving the amorphous solid dispersion precipitated in a matrix formed by the polymer.

In another general aspect, there is provided an amorphous solid dispersion comprising idelalisib and one or more pharmaceutically acceptable excipients which is substantially free from residual solvents.

In another general aspect, there is provided an amorphous solid dispersion comprising idelalisib characterized by x-ray powder diffraction as depicted in Figure-2.

In another general aspect, there is provided an amorphous solid dispersion of idelalisib having a purity by HPLC of more than about 98%.

In another general aspect, there is provided a pharmaceutical composition comprising an amorphous idelalisib together with one or more pharmaceutically acceptable carriers, excipients or diluents.

In another general aspect, there is provided a pharmaceutical composition comprising an amorphous solid dispersion comprising idelalisib together with one or more of pharmaceutically acceptable carriers, excipients or diluents.

In another general aspect, there is provided an amorphous form of idelalisib having particle size distributions, D(10) of about 50 \( \mu \text{m} \) or less, D(50) of about 200 \( \mu \text{m} \) or less, and D(90) of about 400 \( \mu \text{m} \) or less; or D(10) of about 25 \( \mu \text{m} \) or less, D(50) of about 100 \( \mu \text{m} \) or less, D(90) of about 250 \( \mu \text{m} \) or less.
In another general aspect, there is provided a pharmaceutical composition comprising an amorphous form of idelalisib having a particle size distributions, D(10) of about 50 µm or less, D(50) of about 200 µm or less, and D(90) of about 400 µm or less; or D(10) of about 25 µm or less, D(50) of about 100 µm or less, D(90) of about 250 µm or less.

The above description is presented to enable a person of ordinary skill in the art to make and use the various embodiments. Descriptions of specific devices, techniques, and applications are provided only as examples. Various modifications to the examples described hereinafter will be readily apparent to those of ordinary skill in the art, and the general principles described herein - above and after, may be applied to other examples and applications without departing from the scope of the present invention. Thus, the various embodiments are not intended to be limited to the examples described herein after.

In general, idelalisib to be used as the starting material/feed stock may be prepared by the known methods reported in the prior i.e. by using the process as per WO 2005/1 13556 Al, which is incorporated herein as reference.

Examples

**Example-1: Preparation of amorphous form of idelalisib**

Idelalisib (2.5 g) and ethanol (250 mL) were taken into a round bottom flask. The content was stirred for 30 minutes at 50°C to 55°C. The content was filtered through a hyflosupercel bed and washed with ethanol (10 mL). The clear filtrate was subjected to spray drying in JISL Mini spray drier LSD-48 by maintaining the inlet temperature of about 60-65°C and an outlet temperature of about 50-55°C, and flow rate of 10 ml/minute using nitrogen gas to produce 1.5 g of amorphous idelalisib as a white powder (Purity by HPLC: 99.85%). The resulting amorphous idelalisib was characterized by an X-ray powder diffraction pattern, showing a plain halo with no well-defined peaks, as shown in FIG. 1.
Example-2: Preparation of amorphous form of idelalisib
Idelalisib (2.5 g) and ethyl acetate (250 mL) were taken into a round bottom flask, stirred for dissolution and filtered to obtain a clear solution free from particles. The solution was subjected to spray drying to afford the title compound.

Example-3: Preparation of Amorphous idelalisib
Idelalisib (1 g) was dissolved in methanol (100 mL) at 60°C and the resulting solution was subjected to carbon treatment by stirring the solution with an activated carbon (0.4 g) for 10 minutes at 58-62°C. The resulting mixture was filtered through a hyflobed and the filtrate was cooled to 25-30°C. The filtrate was subjected to spray-drying in a mini spray dryer (JISL Mini spray drier LSD-48) at an inlet temperature of about 60-65°C and an outlet temperature of about 50-55°C, and flow rate of 10 ml/minute using nitrogen gas to produce 0.6 g of amorphous idelalisib as a white powder (Purity by HPLC: 99.75%). The resulting amorphous idelalisib was characterized by an X-ray powder diffraction pattern, showing a plain halo with no well-defined peaks, as shown in FIG. 1.

Example-4: Preparation of amorphous solid dispersion of idelalisib with polyvinylpyrrolidone (1:10)
Idelalisib (0.5 g) was added to methanol (50 mL) at 25-30°C and the contents were stirred for 5 minutes at the same temperature, followed by heating at 50°C to form a clear solution. The resulting solution was cooled to room temperature (25-35°C) and then polyvinylpyrrolidone (5 g) was added at the same temperature to obtain a clear solution. The resulting solution was stirred for 30 minutes at room temperature, followed by the removal of solvent by distillation under vacuum at 65-70°C to obtain 5.5 g amorphous solid dispersion of idelalisib with polyvinylpyrrolidone in a ratio of 1:10 (Purity by HPLC: 99.8%).
The resulting amorphous solid dispersion of idelalisib with polyvinylpyrrolidone (1:10) was characterized by an x-ray powder diffraction pattern, showing a plain halo with no well-defined peaks, as shown in FIG. 2.

Example-5: Preparation of amorphous solid dispersion of idelalisib with polyvinylpyrrolidone (1:5)

Idelalisib (0.5 g) was added to methanol (50 mL) at 25-30°C and the contents were stirred for 5 minutes at the same temperature, followed by heating at 50°C to form a clear solution. The resulting solution was cooled to room temperature (25-35°C) and then polyvinylpyrrolidone (2.5 g) was added at the same temperature to obtain a clear solution. The resulting solution was stirred for 30 minutes at room temperature, followed by the removal of solvent by distillation under vacuum at 65-70°C to obtain 3 g amorphous solid dispersion of idelalisib with polyvinylpyrrolidone in a ratio of 1:5 (Purity by HPLC: 99.8%).

The resulting amorphous solid dispersion of idelalisib with polyvinylpyrrolidone (1:5) was characterized by an x-ray powder diffraction pattern, showing a plain halo with no well-defined peaks, as shown in FIG. 2.

Example-6: Preparation of amorphous solid dispersion of idelalisib with hydroxypropylmethyl cellulose (HPMC) (1:10)

Idelalisib (0.5 g) was added to methanol (50 mL) at 25-30°C and the contents were stirred for 5 minutes at the same temperature, followed by heating at 50°C to form a clear solution. The resulting solution was cooled to room temperature (25-35°C) and then hydroxypropylmethyl cellulose (HPMC) (5 g) was added at the same temperature to obtain a clear solution. The resulting solution was stirred for 30 minutes at room temperature, followed by the removal of solvent by distillation under vacuum at 65-70°C to produce 5.5 g of amorphous solid dispersion of idelalisib with hydroxypropylmethyl cellulose (1:10) was characterized by an x-ray powder diffraction pattern in a ratio of 1:10 (Purity by HPLC: 99.82%).
While the present invention has been described in terms of its specific embodiments, certain modifications and equivalents will be apparent to those skilled in the art and are intended to be included within the scope of the present invention.
We Claim:

1. An amorphous form of idelalisib of Formula (I).

(I)

2. The amorphous form of idelalisib according to claim 1 having a purity by HPLC of greater than about 98%.

3. The amorphous form of idelalisib according to claim 1 having a residual solvent less than about 0.5%.

4. The amorphous form of idelalisib according to claim 1 having a moisture content less than about 0.5% wt/wt.

5. A process for the preparation of an amorphous form of idelalisib, the process comprising:
   (a) providing a solution or suspension of idelalisib in one or more solvents; and
   (b) obtaining the amorphous form of idelalisib by the removal of the solvent.

6. The process according to claim 5, wherein the solvent comprises one or more of water, alcohol, ketone, ester, halogenated hydrocarbon, polar aprotic solvent, acetonitrile, tetrahydrofuran, 2-methyltetrahydrofuran, dioxane or mixtures thereof.

7. The process according to claim 6, wherein the alcohol is selected from methanol, ethanol, isopropanol, 2-propanol, 1-butanol, t-butyl alcohol, 1-pentanol, and 2-pentanol; the ketone is selected from acetone, butanone, 2-pentanone, 3-pentanone, methylbutyl ketone, and methyl isobutyl ketone; the ester is selected from ethyl acetate, propyl acetate, isopropyl acetate, t-butyl acetate, and isobutyl acetate; and the halogenated hydrocarbon is selected from methylene dichloride, ethylene dichloride, carbon tetrachloride and
chlorobenzene; polar aprotic solvent selected from dimethylformamide, dimethylsulfoxide, and N-methylpyrrolidone.

8. The process according to claim 5, wherein the removal of the solvent comprises one or more of distillation, distillation under vacuum, spray drying, agitated thin film drying ("ATFD"), freeze drying (lyophilization), filtration, decantation, and centrifugation.

9. An amorphous solid dispersion comprising idelalisib and one or more pharmaceutically acceptable excipients.

10. The amorphous solid dispersion according to claim 9, wherein the pharmaceutically acceptable excipient is a non-ionic polymer or an ionic polymer.

11. The amorphous solid dispersion according to claim 10, wherein the polymer is selected from methacrylic acid copolymers, polyvinylpyrrolidone (PVP), 4-vinylpyrrolidone-vinyl acetate copolymer (copovidone) or copolymers of methacrylic acid and ethylacrylate (EUDRAGIT® L100-55), hydroxypropyl cellulose, hydroxypropylmethyl cellulose (HPMC), hypromellose phthalate, hydroxypropylmethyl cellulose acetate succinate (HPMC-AS).

12. A process for the preparation of an amorphous solid dispersion comprising idelalisib and one or more pharmaceutically acceptable excipients, the process comprising:

(a) providing a solution of idelalisib and one or more pharmaceutically acceptable excipients in one or more solvents;
(b) optionally, filtering the solution to remove insoluble matter; and
(c) removing the solvent from the solution to obtain the amorphous solid dispersion of idelalisib with the pharmaceutically acceptable excipients.

13. The process according to claim 12, wherein the solvent comprises one or more of water, alcohol, ketone, ester, halogenated hydrocarbon, polar aprotic solvent, acetonitrile, tetrahydrofuran, 2-methyltetrahydrofuran, dioxane or mixtures thereof.

14. The process according to claim 13, wherein the alcohol is selected from methanol, ethanol, isopropanol, 2-propanol, 1-butanol, t-butyl alcohol, 1-
pentanol, and 2-pentanol; the ketone is selected from acetone, butanone, 2-pentanone, 3-pentanone, methylbutyl ketone, and methyl isobutyl ketone; the ester is selected from ethyl acetate, propyl acetate, isopropyl acetate, t-butyl acetate, and isobutyl acetate; and the halogenated hydrocarbon is selected from methylene dichloride, ethylene dichloride, carbon tetrachloride and chlorobenzene; polar aprotic solvents selected from dimethylformamide, dimethylsulfoxide, and N-methyl-pyrrolidone.

15. An amorphous solid dispersion comprising idelalisib and one or more pharmaceutically acceptable excipients which is substantially free from residual solvents.

16. An amorphous solid dispersion of idelalisib having a purity by HPLC of more than about 98%.

17. A pharmaceutical composition comprising an amorphous idelalisib together with one or more pharmaceutically acceptable carriers, excipients or diluents.

18. A pharmaceutical composition comprising an amorphous solid dispersion comprising idelalisib together with one or more of pharmaceutically acceptable carriers, excipients or diluents.

19. An amorphous form of idelalisib having particle size distributions, D(10) of about 50 µm or less, D(50) of about 200 µm or less, and D(90) of about 400 µm or less; or

D(10) of about 25 µm or less, D(50) of about 100 µm or less, D(90) of about 250 µm or less.

20. A pharmaceutical composition comprising an amorphous form of idelalisib having a particle size distributions, D(10) of about 50 µm or less, D(50) of about 200 µm or less, D(90) of about 400 µm or less; or

D(10) of about 25 µm or less, D(50) of about 100 µm or less, D(90) of about 250 µm or less together with one or more of pharmaceutically acceptable carriers, excipients or diluents.